New Pathway for The Phase Transfer of Metal Nanoparticles: First Example of Long Chain Hydrosilanes as Phase Transfer Agent

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Seminal discoveries and manipulation of the synthetic routes of nanomaterials have made it possible to generate particles in many different sizes and shapes like spheres, rods, wires, planes, and more, depending on their intended use. Post-synthetic modification of the nanoparticles is often a required step to tailor the chemical, physical, and optical properties for specific applications of nanoscale materials.[1-3] In this regard, It is desirable to develop methods and protocols which will open avenues for the transfer of metal nanoparticles between aqueous and organic media.

Research in our group has provided a unique window with regards to phase activity of poly(hydro)silanes. This research motivated us to investigate monomeric hydrosilanes as phase transfer agents.[4] In this presentation, a new application of long carbon chain substituted hydrosilanes is reported. In this methodology alkyl silanes are used as phase transfer catalysts for the transfer of gold nanoparticles from aqueous to organic solution without compromising the dispersion, stability and morphology of the nanoparticles. This method utilizes n-butylsilane, hexylsilane, octylsilane, and octadecylsilane as transfer agents to complete a ligand exchange, allowing the nanoparticles particles to flow into organic solution. These reactions were monitored and characterized through UV-Vis Spectrometry (UV-Vis), Fourier Transform Infrared Spectroscopy (FTIR), and Transmission Electron Microscopy (TEM). The gold and silver nanoparticles transferred using this protocol maintained their size and shape throughout the reaction. This phase transfer reaction successfully transferred 2-AST stabilized gold and silver nanoparticles to a variety of organic solvents which remained stable for prolonged periods.

References

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